

Plastic Frame Assembly for Bearing Weight  
and Method of Assembly

5    Field of the Invention

        This invention relates in general to frame assemblies and more particularly to a plastic frame assembly that can bear significant weights and a method of assembling the plastic frame assembly.

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Background of the Invention

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        Support or frame assemblies have typically been developed to be able to support significant amounts of weights as seen in their use for chairs and other forms of seating. In general these assemblies have tried to improve the strength and the support of the seating so that the user is more comfortable, while providing easier manufacture and assembly.

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        Prior art frame assemblies addressing the aforementioned issues include, United States Patent No. 268,095 issued on November 28, 1882 to Henry S. Hale. This patent relates a seat which consists substantially of a rectangular outer frame, in combination with a rectangular inner frame in substantially the same plane and fitting closely inside thereof; and it consists substantially in combining with two such frames one or more supporting bars, preferably of metal.

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        Kwasnik et al. is the owner of U.S. Patent No. 5,121,963, which issued on June 16, 1992 and relates to an upper periphery forming a U-shaped channel. A fabric material is wrapped about the substrate having an edge disposed within the U-shaped channel. The armrest assembly further includes a U-shaped retainer ring for interlocking disposition in the channel. The retainer ring includes gripping members for gripping the material as the retainer ring is forcibly inserted in the channel and for retaining the material in

the U-shaped channel. The retainer ring further includes co-acting members spaced laterally from the gripping members and further spaced from the edge of the material and including a pair of longitudinal recesses for interlocking engagement with a plurality of hooks extending from the U-shaped channel to retain the ring and material in the channel.

Seroldi is the owner of U.S. Patent No. 5,645,321, which issued on July 8, 1997 relates to the framework which includes two lateral sections that each have a protruding tongue, provided with fixing U-shaped elements oriented surrounding the tongue. Each belt passes outside the U-shaped sections and is then folded up backwards and inserted between the tongue and the U-shaped element so that the tension exerted by the belt presses the U-shaped element in order to block the end of the belt against the tongue.

Although the prior art addresses some of the issues surrounding frame assemblies and the need for additional support and strength, the prior art devices still require some means to hold the seat or seat material itself in place. Furthermore, prior art devices do not address a frame assembly that is entirely assembled out of plastic. Thus, a frame assembly that has additional strength while being manufactured completely out of plastic, requires minimum parts to hold the seat material in place and is easy to assemble with low cost is desirable.

### Summary of the Invention

An object of one aspect of the present invention is to provide an improved plastic frame assembly for bearing weight and a method of assembling same.

In accordance with one aspect of the present invention there is provided a plastic frame assembly for bearing weight comprising a plastic support member having a bottom portion and a top portion. The bottom

portion has a channel, a plastic-affiliating migratory securing means, and a flexible porous membrane. The plastic affiliating migratory securing means is applied to the channel and the flexible porous membrane is positioned on top of the channel and forced into the channel. The plastic affiliating migratory securing means migrates through the flexible porous membrane and secures the flexible porous membrane to the bottom portion of the plastic support member. The top portion of the plastic support member may register with the bottom portion in such a way so that the flexible porous membrane is held in place only by the plastic affiliating migratory securing means.

Conveniently, the plastic frame assembly may further comprise of a plastic setting member positioned within said channel on top of the flexible porous membrane to force the flexible, porous membrane into the channel for securement to the bottom portion of the plastic support member.

In accordance with another aspect of the present invention there is provided a method of assembling a plastic frame assembly for bearing weight comprising applying to the channel, the plastic affiliating migratory securing means. Positioning upside down on a top ram assembly the plastic support member and securing it to the top ram assembly by spring pins. Positioning on a plate directly below the top ram assembly, a series of adjustable pins to match the contour of a plastic setting member.

Securing the plastic setting member above the series of adjustable pins with spring-loaded hooks and stretching the flexible porous membrane above the plastic setting member. Moving the top ram assembly downwardly so that the series of adjustable pins contact the plastic setting member thereby releasing the spring-loaded hooks and forcing the plastic setting member and the flexible porous membrane into the channel for contact with the plastic affiliating migratory securing means. Releasing the top ram assembly whereby the flexible porous membrane is adhered to the plastic support member on the top ram assembly.

Advantages of the present invention include the ability for the plastic frame assembly to support significant amounts of weight using all plastic components; reducing the number of components or parts for the frame assembly to allow for easier and less costly assembly; use of the plastic frame assembly for chairs, benches, sofas, patio furniture, displays, signs, and in the automotive and aerospace environments, and an easier assembly method that allows for quick assembly with precision contouring of the frame while using only plastics.

#### Brief Description of the Drawings

A detailed description of the preferred embodiments are provided herein below by way of example only and with reference to the following drawings, in which:

Figure 1 in an exploded view, illustrates a plastic frame assembly for a seat;

Figure 2 in an exploded view, illustrates a plastic frame assembly for a back in accordance with a preferred embodiment of the present invention.

Figure 3 in a cross-sectional view along the lines 3-3, illustrates the preferred embodiment of Figure 1 or 2 of the present invention.

Figure 4 in a cross-sectional exploded view along the lines 4-4, illustrates the preferred embodiment of Figure 1 or 2 of the present invention.

Figure 5 in a perspective view, illustrates the assembly machine for the present invention.

Figure 6 in a partial perspective view, illustrates the assembly machine of Figure 5.

Figure 7 in a partial perspective view, illustrates the series of pins of the assembly machine of Figure 5.

Figure 8 in a perspective view, illustrates the top ram assembly of the assembly machine.

In the drawings, preferred embodiments of the invention are illustrated by way of example. It is to be expressly understood that the description and drawings are only for the purpose of illustration and as an aid to understanding, and are not intended as a definition of the limits of the invention.

#### Detailed Description of the Preferred Embodiment

Referring to Figures 1,2,3 and 4, there is illustrated in exploded and cross-sectional views, a plastic frame assembly for bearing weight for a chair seat and back respectively in accordance with a preferred embodiment of the present invention. The plastic frame assembly 10 includes a plastic support member 12 having a bottom portion 14 and a top portion 16. The bottom portion 14 has a channel 18, a plastic-affiliating migratory securing means 20, and a flexible porous membrane 22. The plastic affiliating migratory securing means 20 is applied to the channel 18 and the flexible porous membrane 22 is positioned on top of the channel 18 and forced into the channel 18. The plastic affiliating migratory securing means 20 migrates through the flexible porous membrane 22 and secures the flexible porous membrane 22 to the bottom portion 14 of the plastic support member 12.

The top portion 16 of the plastic support member 12 may register with the bottom portion 14 in such a way so that the flexible porous membrane 22

is held in place only by the plastic affiliating migratory securing means 20. Both the bottom portion 14 and the top portion 16 may be made from injection molded, ergonomically contoured Nylon 6/6, 15% - 30% glass reinforced, depended on whether plastic support member is a back base or seat base for a chair or bench.

The plastic frame assembly 10 may further comprise of a plastic setting member 24 positioned within the channel 18 on top of the flexible porous membrane 22 to force the flexible, porous membrane 22 into the channel 18 for securement to the bottom portion 14 of the plastic support member 12. The plastic setting member 24 adheres to the flexible porous membrane 22 as the plastic affiliating migratory securing means 20 migrates through said flexible porous membrane 22 and contacts said plastic setting member 24.

The plastic setting member 24 may be a flexible plastic spline 26 sized to contour fit into the channel 18. The purpose of the flexible plastic spline 26 is to hold the flexible porous membrane 22 in place during the assembly of the plastic frame assembly 10. The flexible plastic spline 26 is injection molded in a single piece from plastic such as Nylon 6/6 or Nylon 6/6, 15% glass reinforced. The flexible plastic spline 26 may be contoured to match the channel 18 of the bottom portion 14. For example if the plastic frame assembly 10 was constructed for ergonomically designed chair back or seat, the channel 18 would be molded into the bottom portion 14 of the plastic support member 12, and the flexible plastic spline 26 would molded to match the contour of the channel 18.

The flexible porous membrane 22 may be a plastic fabric such as woven mesh polyester fabric 28 with the warp and the weft of different construction and durometer rating. Specifically the warp of the fabric 28 may be a polyester mono-fibre (55 durometer) while the weft may be a polyester multi-strand yarn (1000 denier).

The plastic-affiliating migratory securing means 20 may be a plastic adhesive, such as a two-part acrylic. The purpose of the plastic-affiliating migratory securing means 20 is to retain the flexible porous membrane 22 within the channel 18. Therefore the only element that holds the flexible porous membrane 22 to the plastic support member 12 and allows for weight bearing on the flexible porous membrane 22 is the plastic-affiliating migratory securing means 20.

Referring to Figures 5 -8, in accordance with another aspect of the present invention there is provided a method of assembling a plastic frame assembly 10 for bearing weight. The method of assembling a plastic frame assembly 10 includes applying to the channel 18, the plastic affiliating migratory securing means 20. The plastic support member 12 is positioned upside down on a top ram assembly 30 and is secured to the top ram assembly 30 by spring pins 32. Therefore the channel 18 is facing downwards. The top ram assembly 30 is a vertical ram actuated by an air cylinder. The top ram assembly 30 may develop up to 10,000 pounds of force.

A base plate 34 is positioned directly below the top ram assembly 30 and has a series of adjustable pins 36 arranged in a single row so as to match the contour of the plastic setting member 24. The base plate 34 may have for example 65 pins for a chair seat and 76 pins for a chair back. The heads of the adjustable pins 36 are contoured to fit and guide the contour of the plastic setting member 24. The plastic setting member 24 is secured above the adjustable pins 36 by spring-loaded hooks 38.

The flexible porous membrane 22 is stretched above the plastic setting member 24. In general the flexible porous membrane is pre-stretched by means of four clamping assemblies spaced 90° apart. The clamping assemblies may include a clamp plate mounted on a linear slide and a series of cylinders. A cylinder activates the clamp plate to grip the flexible porous

membrane 22 while another cylinder stretches the flexible porous membrane 22 to the desired tension. The flexible porous membrane 22 may be stretched to different tension requirements in one direction or the other.

5           The top ram assembly 30 moves downwardly so that the series of adjustable pins 36 contact the plastic setting member 24 thereby releasing the spring-loaded hooks 38 and forcing the plastic setting member 24 and the flexible porous membrane 22 into the channel 18 for contact with the plastic affiliating migratory securing means 20. Specifically the top ram assembly 30  
10 presses down on the plastic setting member 24 and the flexible porous membrane 22 with approximately 6000 pounds of force.

15           The flexible porous membrane 22 is trimmed by a hot knife assembly, namely a 22 gauge stainless steel blade coated with a Teflon (Registered trademark) based Endura (Registered trademark) material. The blade is formed to the contour of plastic support member 12 and may have heaters applied to it to elevate the temperature of the blade to 500° F. Prior to the trimming of the flexible porous membrane 22, the clamps are released thereby allowing the hot knife assembly to trim the flexible porous membrane  
20 22.

          The top ram assembly 30 and specifically the cylinder then releases whereby the flexible porous membrane 22 is adhered to the plastic support member 12 on the top ram assembly 30.

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          Other variations and modifications of the invention are possible. All such modifications or variations are believed to be within the sphere and scope of the invention as defined by the claims appended hereto.